Table of content

1. General

The XF wireless pick-up sensors can be placed in - or attached to - an object to sense whether it is moving or laying still. Typically, this feature is used to detect if an object, such as merchandize in a store, is picked up or placed back. This document provides explanation of the available functionalities and instructions on how to install and integrate the sensor into your digital signage installation.

The information in this document is created for users who are familiar with the Nexmosphere API and are able to control a basic setup with a Nexmosphere API controller. If this is not the case yet, please read the general documentation on the Nexmosphere serial API first.

2. Product overview

The XF-P3 wireless pick-up sensor is available in 3 variations:

|	XF-P3W	XF-P3B	XF-P3N
Pick-up detection	✔	✔	✔
Place-back detection	✔	✔	✔
Color housing	white	black	no housing
Battery included	✔	✔	✘
Battery replacement	by Nexmosphere	by Nexmosphere	by customer

XF-P3N

XF-P3W

The XF-P3 sensor utilizes a 3-axis accelerometer to measure rotation and detect whether it is moving or laying still. It is powered with a CR2032 battery and can be switched on or off via a physical switch.

The sensor is paired to a Wireless X-talk channel on an EM-F base station. At each pick-up or place-back detection, the sensor will send a wireless message indicating the status of the sensor. The communication protocol between the XF-P3 sensor and EM-F base station is ANT+. The EM-F base station is available in 3 models:

	EM-F1	EM-F4	EM-F8
Assembled onto XM-350	✔	✔	✔
Channel LEDs	✔	✔	✔
Wireless X-talk channels	1	4	8
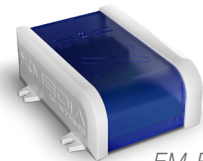
EM-F

This document will focus mainly on the functionalities of the XF-P3 Wireless pick-up sensor. For more information on the EM-F base stations, please see the respective Quick Start Guides.

3. Functionalities and API commands

The XF-P3 wireless pick-up sensor provides the following functionalities:

1. **Pair to EM-F base station** - to send wireless X-talk messages when triggered
2. **Pick-up and place-back detection** - detect if an object is picked up or placed back
3. **Auto-shutdown during transport** - detects if the sensor is in transport to save battery life
4. **Unpair from EM-F base station**

The following sections will cover each of these functionalities in detail. Please note that for each API example in this document, X-talk interface address 111 is used (X111). When the sensor is connected to another X-talk channel, replace the "111" with the applicable X-talk address.

3.1 - Pair to EM-F base station

As the XF-P3 sensor communicates wirelessly, it needs to be paired to an EM-F base station in order to generate API messages when the sensor detects a pick-up or place-back. There are 2 methods to pair an XF-P3 sensor to a Wireless X-talk channel of an EM-F base station: **Pair button** or **API command**. Before starting the pair procedure, please check the following:

• When using an XF-P3**N** sensor, please make sure to **place a CR2032 battery** before starting the pairing procedure. The XF-P3**W** and XF-P3**B** sensor already have a battery placed within the enclosure.

• Make sure the XF-P3 sensors are **switched ON** and that they **lay still**. The green LED on the sensor will briefly go on right after the device is switched on.
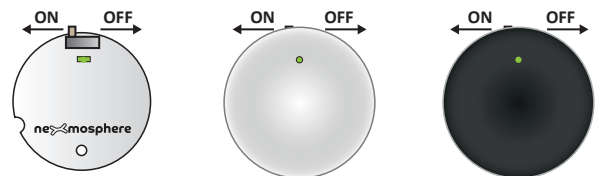
Pair button method

1. **Press and hold control button A for a few seconds.***
   The blue Pair LED will start to blink.

2. **Press Control button A to toggle to the channel you want to pair.***
   The green LED of the selected Wireless X-talk channel will blink.

3. **To pair: lift the sensor which you want to pair to the selected channel.**
   The green LED of the paired channel will be lit continuously for 1 second to confirm pairing was successful.

4. **After, the next channel in line is automatically selected to be paired.**
   If the next channel also needs to be paired, simply lift another sensor.

5. **To quit pairing mode, hold button A for a few seconds.***
   The status LED of the EM-F8 base station will blink 3 times to confirm exit of pairing mode.

EM-F
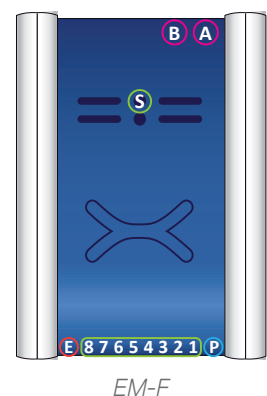
Tip: use a pen or small screwdriver to press the buttons

API command method

1. **Send the command [PAIR] to the channel you want to pair.**
    For example: if you want to pair a XF-P3 sensor to channel 111, the API command is `X111B[PAIR]`
    The green LED of the selected channel will start to blink to confirm it is in pairing mode.

2. **To pair: pick-up the sensor you want to pair to the selected channel.**
    The green LED of the paired channel will be lit continuously for 1 second to confirm pairing was successful.

3. **Right after, the main LED of the EM-F base station will blink 3 times to confirm exit of pairing mode.**

Regardless what pairing method is used, an XF-P3 sensor only needs to be paired one time. After a power cycle it will remain paired. Please note that a sensor can be paired to multiple base stations. So when pairing, please make sure that no other sensors are accidentally lifted and paired.

3.2 - Pick-up and place-back detection

When an object is picked up, the sensor will detect the movement and an API command is triggered. Vice versa, when the object is placed back, it will detect that it is laying still and an API command is triggered as well. These API messages have the following format:

X111A[3]   *Object is picked up*
X111A[0]   *Object is placed back*

When implementing pick-up or place-back detection, consider the following:

*   The sensitivity of the pick-up detection and place-back detection can be adjusted. For more information please see Settings, page 7.
*   The measuring method for pick-up and place-back detection can be adjusted to suit different applications. For more information please see Settings, page 7
*   When an XF-P3 sensor detects a pick-up, the status LED of the Wireless X-talk channel on the EM-F base station will go on.
*   When an XF-P3 sensor detects a place-back, the status LED of the Wireless X-talk channel on the EM-F base station will go off.
*   In order for a pick-up to be detected, the sensor must first have detected a place-back.

pick-up

place-back

Example API messages

XF-P3 sensor paired to channel 113 is picked-up
X113A[3]

XF-P3 sensor paired to channel 126 is placed back
X126A[0]

3.3 - Auto-shutdown in transport

The sensor needs to be switched off before shipment, in order to make sure the battery won't drain. In case the sensor is still switched on during transport, it has the ability to detect this and shutdown automatically. It does so by combining movement data with (the lack of) communication data with an EM-F base station. This feature can be enabled or disabled via the following API commands:

`X111B[AUTOSHUTDOWN=OFF]`   Disable auto-shutdown

`X111B[AUTOSHUTDOWN=ON]`   Enable auto-shutdown (default)

When the sensor has shut down automatically, it can be switched on again by first switching the sensor off, and then switching the sensor on (see page 2). Even with auto-shutdown enabled, the sensor will still drain unnecessarily when left on during transport. *It is therefore still highly recommended to switch the sensor off before shipment.*

3.4 Unpair sensor from EM-F base station

There are 2 methods to unpair an XF-P3 sensor from a Wireless X-talk channel of an EM-F base station: **Pair button** or **API command**. Before starting the unpair procedure, please check the following:
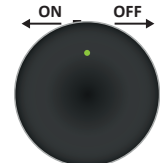
- Make sure the XF-P3 sensors are **switched ON** and that they **lay still**. The green LED on the sensor will briefly go on right after the device is switched on.
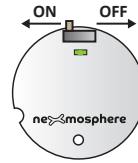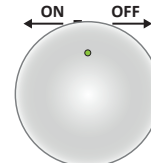

XF-P3N   XF-P3W   XF-P3B

Unpair button method

1. **Hold control button B for a few seconds.***
   The red Unpair LED (E) will start to blink.

2. **To unpair: lift the sensor which you want to unpair from the selected channel.**
   If the picked-up sensor was paired to a channel on the EM-F8, the green LED of the unpaired channel will be lit continuously for 1 second to indicate which channel was unpaired. Simultaneously, the red Unpair LED of the EM-F8 will be lit continuously for 1 second to confirm unpairing was successful.

Tip: use a pen or small screwdriver to press the buttons
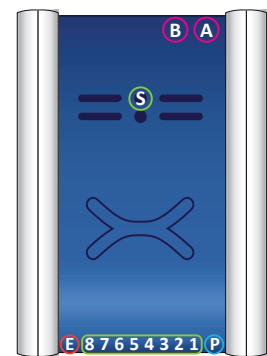

EM-F

API command method

1. **Send the command [UNPAIR] to the channel you want to unpair.**
   For example: if you want to unpair channel 111, the API command is `X111B[UNPAIR]`
   The green LED of the unpaired channel will be lit continuously for 1 second to indicate which channel was unpaired. Simultaneously, the red Unpair LED of the EM-F8 will be lit continuously for 1 second to confirm unpairing.

4.1 Connection Diagrams

The XF-P3 Wireless pick-up sensor must be paired to a Wireless X-talk interface and is therefore only compatible with an EM-F module, assembled onto an XM-350 controller. The XF-P3 sensor can't be paired to an XN or XC controller.
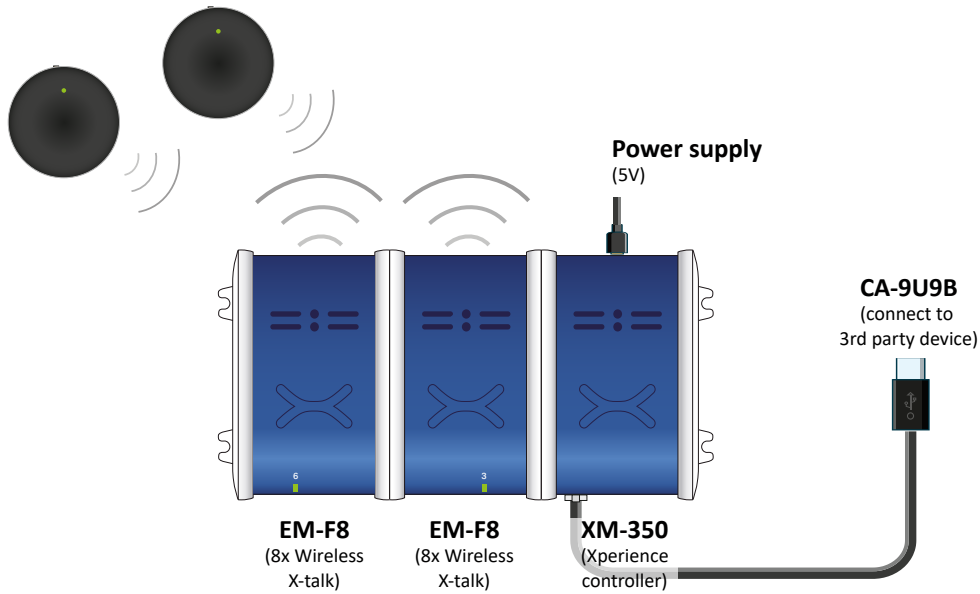
*Example setup with an XM Controller and 2 EM-F base stations*

4.2 Hardware integration guidelines

Installing the sensor

Typically the sensor is applied in Lift&Learn applications for larger-sized merchandize such as footwear, or handbags. In these scenarios, the sensor can simply be placed inside the object (e.g. shoe). In case the sensor must be adhered to an object, we recommend using industrial grade double-sided tape. For projects in which a different formfactor is required and you want to design your own custom casing, the XF-P3N sensor (without casing) can be applied.

Wireless detection range

The typical detection range between the XF-P3 sensor and EM-F base station is 10 meters. Large metal objects close to the sensor or base station can decrease the detection range.
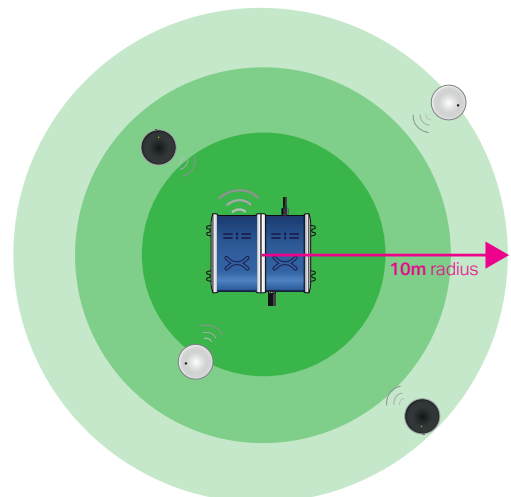
Battery life

The battery life of the XF-P3 sensor is determined by the number of pick-ups and average pick-up time. When laying still, the sensor's power consumption is neglectable. In the table below, an indication is given of the battery life in various usage scenarios.

| average pick-up time	1000 pick-ups / month	2000 pick-ups / month	5000 pick-ups / month
10s / pick-up	3.0 years	2.2 years	1.4 years
20s / pick-up	2.8 years	2.0 years	1.0 year
30s / pick-up	2.4 years	1.6 years	0.8 year
60s / pick-up	1.8 years	1.2 years	0.6 year

Switch sensor off during transport

To prevent battery drainage, it is important to switch the sensor off during transport. Although the sensor's auto-shutdown feature is enabled per default, it will still drain the battery unnecessarily if it is switched on during transport. For more information on the sensor's auto-shutdown feature, please see page 4.

Battery level indication

The battery level is indicated via the status LED on the sensor, right after it is switched on. The number of blinks indicates the battery life.

- **3x** blink   **high** battery level
- **2x** blink   **medium** battery level
- **1x** blink   **low** battery level

battery indication LED
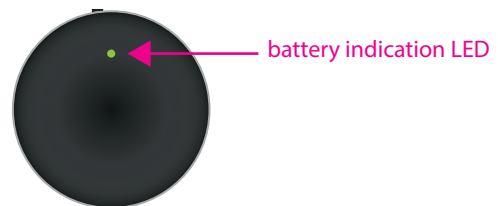
5.1 - Settings

The XF-P3 sensor has multiple settings which determine the behaviour and output of the sensor. The settings can be adjusted by sending X-talk setting commands. The settings will be applied when picking up the sensor after the setting command has been send to the EM-F base station. After a power cycle of the EM-F base station, the settings return back to default.

Setting 5: Pick-up sensitivity

1. Sensitivity level 1	`X111S[5:1]`
2. Sensitivity level 2	`X111S[5:2]`
3. Sensitivity level 3	`X111S[5:3]`
4. Sensitivity level 4	`X111S[5:4]`
5. Sensitivity level 5 (default)	`X111S[5:5]`
6. Sensitivity level 6	`X111S[5:6]`
7. Sensitivity level 7	`X111S[5:7]`
8. Sensitivity level 8	`X111S[5:8]`
9. Sensitivity level 9	`X111S[5:9]`
10. Sensitivity level 10	`X111S[5:10]`

The setting determines how much movement there needs to be for the sensor to detect a pick-up. Level 1 is the most sensitive option, meaning that little movement is required for the sensor to detect a pick-up. Level 10 is the least sensitive option, meaning that more movement is needed for the sensor to detect a pick-up.

Setting 6: Place-back sensitivity

1. Sensitivity level 1	`X111S[6:1]`
2. Sensitivity level 2	`X111S[6:2]`
3. Sensitivity level 3	`X111S[6:3]`
4. Sensitivity level 4	`X111S[6:4]`
5. Sensitivity level 5 (default)	`X111S[6:5]`
6. Sensitivity level 6	`X111S[6:6]`
7. Sensitivity level 7	`X111S[6:7]`
8. Sensitivity level 8	`X111S[6:8]`
9. Sensitivity level 9	`X111S[6:9]`
10. Sensitivity level 10	`X111S[6:10]`

The setting determines how steady the sensor needs to be for it to detect a place-back. For sensitivity level 1, the sensor must be least steady for a place-back to be detected. For level 10, the sensor must be most steady for a place-back to be detected.

Setting 7: Number of home positions

Set number of home positions   `X111S[7:X]`

X is a value between **1-10** and its default value is **2**. It sets the number of home positions which the sensor can store. When the sensor detects a placed-back, it's current position is automatically stored as "home position". When the sensor is placed back in the same position as a stored home position, it detects a place-back faster.

Setting 8: Pick-up detection mode

1. Relative mode (default)	`X111S[8:1]`
2. Absolute mode	`X111S[8:2]`

The sensor continuously measures it's X, Y, Z position to detect if it is being moved (picked up) or laying still (placed back).

The detection method for a pick-up is per default set to **Relative mode**. This means that the delta of consecutive measurements of it's position determines if there was enough movement to be classified as a pick-up. In practice, this means that in case the sensor is moving very slowly, or only rotating over 1 axis, no pick-up will be detected , as the delta between two consecutive measurements is too small. It also makes sure that small movements won't cause any ghost pick-ups. Relative mode (setting 8:1) is the recommended mode for lift & learn scenarios.

When set to **Absolute mode** (setting 8:2), the delta is measured over the current positions vs the home position (place back position) of the sensor. In practice, this means that even when the sensor is moving slowly or only rotating over 1 axis, a pick-up will still be detected. This mode is recommended for applications in which the sensor is attached to objects which have a fixed rotation point, for example to detect if a door is being opened.

Setting 10: Number of Transmit Repeats

1. Repeat 1x	`X111S[10:1]`
2. Repeat 2x	`X111S[10:2]`
3. Repeat 3x	`X111S[10:3]`
4. Repeat 5x	`X111S[10:4]`
5. Repeat 8x (default)	`X111S[10:5]`
6. Repeat 16x	`X111S[10:6]`

When the XF-P3 doesn't receive an acknowledgement from the EM-F that a wireless message has been received, it will resend the message. Setting 10 determines how many repeats of a resends the XF-P3 message will transmit.

Setting 11: Transmit power

1. -20dB	`X111S[11:1]`
2. -12dB	`X111S[11:2]`
3. -4dB	`X111S[11:3]`
4. 0dB (default)	`X111S[11:4]`
5. 4dB	`X111S[11:5]`

6. Quick test

In order to test if the XF-P3 wireless pick-up sensor is installed correctly, please follow the test procedure below:
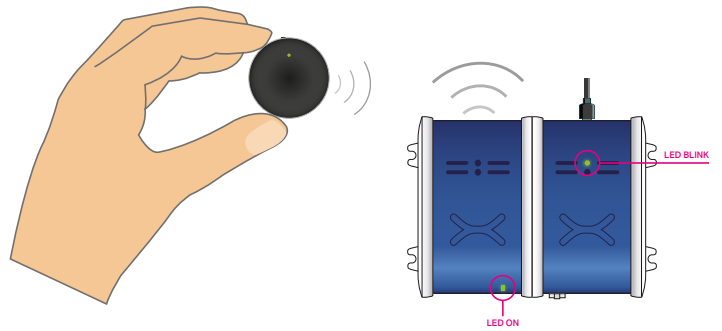
Step 1 - Pairing

Pair the XF-P3 sensor to an EM-F base station. Secondly, power the Xperience controller.

See page 2 and 3 for instructions on how to pair.

Step 2 - Pick-up detection

**Pick-up the sensor, or the object to which the sensor is attached.**

The green channel LED on the EM-F base station should go on. The status LED on the XM-350 controller should blink once.

Step 3 - Place-back detection

Place back the sensor, or the object to which the sensor is attached.

The green channel LED on the EM-F base station should go off. The status LED on the XM-350 controller should blink once.
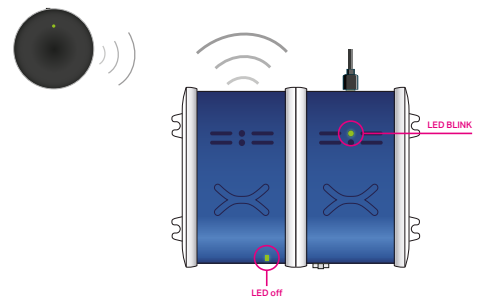
In case any of the steps above does not provide the expected result, please check the installation guidelines in this document.

For a full test we recommend to connect the setup to a mediaplayer or PC and test all API commands listed in this document (see section 3, page 2). For more information on how to setup a test for your controller, please see the Quick Start Guide of the Xperience controller you are using. These are available on nexmosphere.com/support-documentation

Please contact support@nexmosphere.com for any support questions you may have.